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Density of Liquids and Refractive Index of Liquids in Contact. *By* A. L. CLARK, *Ph.D., Prof. of Physics, Queen's University, Kingston, Ontario.*

WHILE experimenting with various pairs of liquids which remain sufficiently insoluble to maintain a meniscus of separation, I came across the phenomenon described below. Chloroform, which is nearly insoluble in water and possesses a density of about 1·4 at ordinary temperature, has a critical density of about ·5. The density of water at 260°, the critical temperature of chloroform, is about ·66, so that as the temperature rises, the density of chloroform falls off more rapidly than that of water, and at one temperature they are equal. I placed chloroform and water together in a Natterer's tube and heated in a paraffin bath. At a few degrees below the critical temperature of chloroform the equilibrium becomes unstable and the system overturns, the chloroform rising to the top. As it cools down again the chloroform sinks again to the bottom *.

The temperature at which the phenomenon occurs is higher than was expected from the study of liquid density curves of other liquids (that for chloroform seems never to have been investigated). This is due no doubt to the solution of chloroform in the water and water in the chloroform tending to equalize the densities. With pure chloroform and water, however, the upset is certain. The phenomenon is very interesting to watch, particularly when the system is cooled. The chloroform settles down into the water stretching the surface film more and more, and finally breaks through.

Another very interesting phenomenon discovered in the

* The same phenomena may be seen with aniline and water.

same experiment was observed as follows. The meniscus between the two liquids is visible on account of the different indices of refraction. At ordinary temperature the index for chloroform is 1·45, while that of water is 1·33. The index for chloroform decreases more rapidiy with rising temperature than does that of water, so that eventually the index of chloroform falls below that of water. When the two indices are equal the separating surface disappears from view to reappear again when the temperature is raised still more. The disappearance is so complete that when the experiment was first made it was given up at this point, as there was every appearance of homogeneity just as though mixture of the two liquids was complete. In the case described above the temperature for disappearance of the meniscus is considerably below that at which the liquids change places.

The tube used was a thick-walled tube about 6 cm. long with internal diameter of 7 mm.